

Senior Design Project Description

Company Name	Carrier Corp	Date Submitted	6/16/2017
Project Title	Design Improvement for Heat Exchanger Tube Insertion (CAR_HEATX)	Planned Starting Semester	Fall 2017

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	4	Electrical	
Computer		Systems	
Other ()			

Project Overview:

UTC Carrier is a global corporation with an operation in Charlotte that designs and manufactures commercial class air conditioning systems for commercial buildings. Their operation covers many facets of Mechanical Engineering including heat transfer, thermodynamics, structures, pressure vessel design, strengths of materials and fabrication methods. A key building block for many models are heat exchangers. This is an expensive part of the total system and improvements in the design and production of these units can have a strong impact for the Company.

Initial Project Requirements:

The type of heat exchanger for this project is a shell and tube heat exchanger. In this type of heat exchanger, a process fluid is passed through the multiple tubes that are placed inside of a cylindrical shell. A second fluid is circulated in the shell and passed over the tubes with a design objective of absorbing heat from the process or transferring heat to the process. The size of the shell, numbers of tubes, materials of construction, wall thickness, etc. are design variables to consider based on the application. Carrier makes these in all sizes and shapes. One common part of the production of heat exchangers is the individual tubes must be manually inserted into the front tubesheet, then into intermediate tube sheets, all the way to the tubesheet at the far end.

This operation is very labor intensive. Threading the individual tubes through the sheets must be done with care to avoid damaging the tube and ensuring the correct pathway is followed. Since some tube sheets can have over a hundred tubes, the labor hours, cost and impact on quality is



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significant. The objective of this project is to consider the design and production process to find improvements that can reduce the production labor content and improve the quality of the produced product.

Expected Deliverables/Results:

- Documented designs for product and/or production devices that meet the objective of the project
- User manual for any production device designed
- Prototypes for product or production devices developed
- Test results which show the “before” and “after” results on a significant enough sample to prove the design.
- Supporter consulted before Expos to see if there is any steps to take to protect any IP, should any arise during the project.

Disposition of Deliverables at the End of the Project:

All deliverables to be given to Industry Supporter immediately after the conclusion of the May Expo. Any material ready before the Expo can be delivered if not needed as part of the Expo presentation.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- Mechanical design
- Software
- Video (to capture operation for user documentation)
- Design reviews to be performed at the Industry supporters Charlotte location.